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ABSTRACT

This paper on postsecondary outcomes illustrates a technique to determine whether or not mainstream models are appropriate for predicting educational outcomes of American Indians (AIs) and Alaskan Native (ANs). It introduces a prominent statistical procedure to assess models with empirical data and shows how the results can have implications for theory, practice, and future research. The research design and assessment method involved a sample of 197 sophomores and 191 seniors from the High School and Beyond study conducted by the National Center for Education Statistics from 1980 to 1986. Theoretical implications and implications for practice based on the results of the assessment are discussed as well as implications for future research. The findings suggest that family background, postsecondary intentions (both prior to and during college), and formal and informal academic integration were central to postsecondary outcomes for both cohorts. In addition, important aspects of the Tinto model for the sophomore cohort included the effects of academic skills, personal abilities, and prior schooling on initial postsecondary intentions. For the senior cohort, initial postsecondary intentions and goal commitment were also important factors influencing academic integration. Contains 54 references. (GLR)

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Assessing Tinto's Model of Institutional Departure Using American Indian and Alaskan Native Longitudinal Data

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ASSOCIATION FOR THE STUDY OF HIGHER EDUCATION

This paper was presented at the annual meeting of the Association for the Study of Higher Education held at the Park Plaza Hotel & Towers in Boston, Massachusetts, October 31-November 3, 1991. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

Assessing Tinto's Model of Institutional Departure Using American Indian and Alaskan Native Longitudinal Data

It is well known that many studies have assessed Tinto's (1975, 1987) model of institutional departure using longitudinal data gather from various ethnic and racial student populations. However studies examining the validity of Tinto's model with American Indian and/or Alaskan Native (AI/AN) longitudinal data are nonexistent. In light of the historically high postsecondary attritions rates of AI/AN students, the purpose of the present study was to assess the theoretical and practical implications of Tinto's model using AI/AN longitudinal data. The intent is to illustrate a technique to determine whether or not mainstream models are appropriate for AI/ANs. In doing so, the reader will be introduced to a prominent statistical procedure to assess models with empirical data and how the results can have implications for theory, practice, and future research.

Building on the work of Spady (1970), Tinto has had widespread influence on higher education research and practice by linking various time dependent or longitudinal student and institutional factors to postsecondary outcomes. Briefly, the Tinto model advances the view that a student's pre-entry attributes (i.e., family background, skills and abilities, and prior schooling) affect their postsecondary intentions, goals and commitments prior to entering a higher education institution. Tinto believes that college departure occurs when there is an incongruency between the student's pre-entry attributes, intentions, goals and commitments and the campus environment that prohibits the student's integration into the formal and informal academic and social systems of the institution. It is the institutional experience of integrating that impacts the student's postsecondary intentions, goals,

and commitments. These intentions, goals and commitments will, in turn, determine whether or not a student decides to persist or depart.

A review of the literature on AI/AN postsecondary departure would seem to support various aspects of the Tinto model. For example, some researchers have found that pre-entry attributes like family background (Osborne & Cranney, 1985; Rindone, 1988), academic skills and personal abilities (Artichoker & Palmer, 1969; Wittaker, 1986), and prior schooling (Lin, 1990; Beaty & Chiste, 1986) will determine whether or not an AI/AN student will be successful in college. There are other studies that indicate those AI/AN student's with postsecondary intentions, goal commitment, and institutional commitment in high school are more likely to persist (NCES, 1988a, 1988b). Still others support the view that intentions and commitment are significantly influenced by the student's integration into the academic and social systems of the institution (Edwards, Edwards, Daines, & Reed, 1984). The degree of integration and its affect on intentions and commitment have been found to be affected by the available institutional support systems, and if certain support systems are not in place, it is likely that the institutional experience will lead to departure (Falk & Aitken, 1984; Lin, LaCounte, & Eder, 1988; Wells, 1989; Wright, 1985).

The literature would, as a whole, support using the Tinto model as a conceptual framework to guide research on AI/AN postsecondary attrition and/or develop postsecondary retention programs. However, it would be a tenuous undertaking since no single study has examined the longitudinal process of AI/AN postsecondary departure as presented in the Tinto model. To address this unmet need, the primary objective of this study is to assess the full Tinto model with

AI/AN longitudinal data.

Here then lies another objective of the present study. There is need to underscore the importance of analyzing AI/AN data in national longitudinal data bases. Despite the many studies that have been generated from longitudinal student studies sponsored by the National Center for Education Statistics (NCES) few studies report findings on AI/ANs (NCES, 1985; Pavel, 1989).. It is common knowledge that AI/ANs typically are neglected altogether in student research using national longitudinal data because the sample size is considered too small, not descriptive enough, and self identification is unreliable (Tippeconnic, 1990). These conditions are not going to change unless efforts are made by AI/AN scholars to access these data bases and "mine" them for whatever they have to offer. The intent is to establish a presence and interest in analyzing the AI/AN data and call attention to the research community that we need to adequately address the issue of sampling and measurement as it relates to AI/ANs.

Research Design

Sample and Data

The sample used in this study consisted of 197 sophomores and 191 seniors respondents drawn from the High School and Beyond (HS&B) study conducted by NCES from 1980 to 1986. Data collection was guided by broad research issues that sought to survey a national representative sample of high school sophomore and seniors during and after high school. The research issues were broad so that researchers could explore a variety of issues. Survey items relevant to this study (see Table 1) gathered data on individual and family background, cognitive test results measuring verbal and quantitative abilities, and high school experiences.

Additional data were collected on the subjects' educational and occupational intentions and commitments in high school, postsecondary experiences, and educational/occupational intentions after entering college. Data also were collected on the subjects' educational attainment after graduating from high school, four years later for the sophomore cohort and six years later for the senior cohort.

Insert Table 1 about here

Method

The method used to assess Tinto's model with AI/AN data was structural equation modeling. The statistical procedures were carried out using LISCOMP (Muthén, 1988), a computer program suitable for student persistence research with categorical data (Stage, 1988). Due to the sample size and moderate complexity of Tinto's model, the present study used an approach in structural equation modeling that treats all latent variables as directly observed variables (i.e., no measurement equations are used). Some constructs in Tinto's model are measured by a composite variable consisting of two or more survey items. The Tinto model, as initially assessed in this study, is presented in Figure 1 as a standard path diagram.

Insert Figure 1 about here

LISCOMP generates various statistics or output to assess how well theory represents the real world. Component fit measures like coefficient estimates and standard errors are used to assess strengths and weaknesses of a model by ascertaining the relationships or paths among constructs and/or variables. Using traditional hypothesis testing procedures, coefficients or parameter estimates twice

as large as their standard errors are considered statistically significant with alpha set at .05. Those less than twice as large as their standard errors are considered insignificant because any purported relationship may be due to sampling fluctuations and not to real effects, whether direct or indirect.

The root mean square residual (RMR), chi-square statistic (χ^2) to degrees of freedom (df) ratio, and probability level (p) are used to determine a model's overall fit to the data. The RMR is an average of the error variances and covariances among the various relationships depicted in the model. It can be used to assess changes to the model using the same data by taking the average discrepancy between structural coefficient estimates and hypothesized covariance matrices. The RMR is measured on a scale of 0 to 1.00 and values $\leq$.05 are preferred.

The χ^2/df ratio and p level can be used to evaluate the model's overall fit to the data. A high ratio of χ^2 to df with $p < .05$ will indicate a poor fit between the model and the data. A low ratio with $p > .05$ indicates a good fit. Depending on sample size, acceptable values for the χ^2/df ratio range from $\leq$2.00 (Byrne, 1989) to $\leq$3.00 (Carmines & McIver, 1981), with $\leq$5.00 sometimes considered a reasonable starting point to consider additional refinements (Wheaton, Muthén, Alwin, & Summers, 1977).

A small χ^2 with $p > .05$ indicates a close correspondence between the theory and sample data (Carmines & McIver, 1981). The effect of sample size on the χ^2 statistic is well known even when incorporating df (Marsh, Balla, & McDonald, 1988). On the other hand, simulated studies appear to suggest that the χ^2 test is supported as a valid assessment of model fit with sample sizes approaching 200 (Boomsma, 1982). However, as noted by others, the component fit measures and

measure of overall fit and need to be interpreted together and cautiously if the model is complex and the sample size is relative small (Gallini & Mandeville, 1984; Anderson & Gerbing, 1988; Schmitt & Bedeian, 1982; Bollen, 1989). As in the case of this study, the sample size is considered small when it has between 10 to 20 cases per variable. Optimally, a rule of thumb is that the study should strive to have at least 40 cases per variable.

Findings

An initial assessment of Tinto's model (as shown in Figure 1) resulted in the determination that there was a weak fit between the model and the AI/AN HS&B sophomore cohort data; the χ^2/df ratio of 9.0, $p > .000$, and RMR=.28 were deemed unacceptable. In other words, the model as stated did not represent the sample data very well. The overall measures of fit were so weak that the component fit measures proved problematic and could not be trusted. An exploratory effort was undertaken to determine ways to fit the Tinto model to the AI/AN sophomore cohort data. In the exploratory mode, the researcher is attempting to determine how the theory or model could better represent the sample data.

The Tinto model fitted to AI/AN data. The Tinto model was fitted to the sophomore cohort data until the measures of overall fit (χ^2/df ratio=1.05, p=.39, and RMR=.06) were within or near the limits established in this study as being acceptable. While keeping all the paths in the original Tinto model, additional paths were added in order to account for the variance in AI/AN postsecondary outcome. All added paths were statistically significant at the the .05 alpha level and consistent with the theoretical model. This means that individual paths were added when: (1)

Each coefficient (or path in the model showing a relationship) to be estimated was significantly different from zero while improving the overall fit of the model to the sample data, and (2) the paths were reasonable given the views advanced by Tinto.

Figure 2 shows the fitted Tinto model in path diagram form; it identifies paths that were significant in the initial Tinto model as well as the significant paths that were added. The reader should note that while retained throughout the analysis, all paths not statistically significant included in the initial assessment of the Tinto model shown in Figure 1 are absent in the remaining figures to reduce clutter.

Insert Figure 2 about here

During this stage of the analysis it is important issue to address whether or not the significant path coefficients make sense. Though the effect is small, it seems that significant negative effects of Prior Schooling on Outcome are contradictory to what one might expect. For example, a positive relationships would mean that those respondents with a high grade point average and pursuing an academically oriented program of study in high school are more likely to get a degree then those who had low grade point average and pursued a general program of study. A cross tabulation of Prior Schooling by Outcome revealed that 42 percent or 17 out of 40 respondents having the lowest values measuring Prior Schooling (i.e., low grade point average and pursued a vocational program of study in high school) received a postsecondary degree compared to only 26 percent or 9 of the 34 who had the highest values (i.e., high grade point average and pursued an academic program of study in high school).

Confirming the fitted Tinto model. The next step in the analysis was to conduct a confirmatory analysis of the fitted Tinto model with AI/AN HS&B senior cohort data. The confirmatory analysis resulted in an acceptable χ^2/df ratio (1.11), probability level (.30), and RMR (.06). Figure 3 is a path diagram showing the significant paths of the fitted Tinto model with the senior cohort.

Insert Figure 3 about here

Again, there were several significant coefficients that deserve closer inspection. The small but negative effect of Institutional Commitment-T_2 on Outcome appears contradictory to what one might expect. For example, it is thought that students with a higher degree of satisfaction with the campus social life and cultural activities would be more inclined to develop a goal commitment to complete college. Likewise, those most satisfied with the prestige of a school are more likely to acquire a postsecondary degree than those who are not as satisfied.

A cross tabulation of Informal Social Integration by Goal Commitment-T_2 revealed that 51 of the 229 respondents had high measures of Informal Social Integration with low measures of goal commitment. On the other hand, only 47 of the respondents with high measures of Informal Social Integration had high measures of Goal Commitment-T_2. A cross tabulation of Institutional Commitment-T_2 by Outcome indicated that out of 108 respondents with high measures of Institutional Commitment-T_2, over half did not receive a postsecondary degree six years after high school graduation.

Discussion

Several factors guide this discussion of the theoretical and practical implications of these findings as well as implications for future research. First, the AI/AN data drawn from HS&B, or any other NCES data bases for that matter, may not be robust enough to accommodate efforts to assess the validity of existing theoretical models. A consequence is that any attempt to interpret the findings must be described in such a way as to avoid drawing complaints of unwarranted inferences. In lieu of such a warning, if the analysis and subsequent interpretation can result in substantive claims, broadly indicative as they may be, it may make a contribution to the research literature on topics that have received little or no attention. Moreover, the lack of research in this area using NCES data calls for small but significant steps to be taken.

Theoretical Implications

The statistically significant coefficients of the fitted Tinto model can determine the theoretical implications of Tinto's model when applied to AI/AN data. For both sophomore and senior cohorts, family background, postsecondary intentions, and academic integration are important constructs within the Tinto model that directly and indirectly influence postsecondary outcomes. Among the pre-entry attributes, family background had the largest and most consistent influence on postsecondary intentions prior to pursuing a postsecondary degree. In turn, postsecondary intentions after being in college and formal academic integration consistently had an influence on postsecondary outcome while informal academic integration had a direct influence on formal academic integration for both cohorts.

The findings also suggest differences when applying Tinto's model to

separate high school cohorts. In the context of the sophomore data only, important factors include academic skills, personal abilities, and prior schooling on initial postsecondary intentions. In addition, academic integration directly influences informal social integration which, in turn, directly influences outcome. Informal academic integration also directly influences outcome. For seniors only, the effect of initial goal commitment on formal academic integration and initial postsecondary intentions on informal academic integration are significant. The significant effect of formal academic integration on outcome is also apparent through its direct influence on postsecondary intentions while pursuing a postsecondary degree which, in turn, significantly influences outcome.

The theoretical implications of this study are not concrete for several reasons. The results clarify that some aspects of the fitted Tinto's model are more prevalent than others when applied to AI/ANs and accounts reasonably well for AI/AN postsecondary educational attainment or lack there of (χ^2/df ratio is close to zero). However, it is likely that other factors are influencing postsecondary outcome because the fit is far from perfect (i.e., χ^2/df ratio is close to zero and all coefficients estimated show strong relationships). Other factors influencing AI/AN postsecondary departure may be associated with policy environments and organizational characteristics (Richardson & Skinner, 1991), financial aid (Cabrera, Stampen, & Hansen, 1990), and external commitments (Tinto, 1987). However, it is unclear to what extent these and other factors influence AI/AN postsecondary outcomes since no proper indicators for most of these factors were available in the HS&B data base, and generally they have not been included in other published research using the Tinto model. Until such time that we can incorporate other

factors into the model, it will be difficult to discern the interrelated factors that have a direct and indirect effect on AI/AN postsecondary departure.

Implications for Practice

Factors within the Tinto model that had a statistically significant effect on postsecondary outcome for both cohorts may be useful to direct recruitment and retention practices related to AI/AN students. For example, as other research has noted, institutional efforts to recruit AI/AN students could focus on the student's family and postsecondary intentions (Osborne &Cranney, 1985; Edwards et al., 1988; Lin, 1990; Rindone, 1988). In particular, efforts can be directed at helping parents to encourage and support their children to develop their academic achievement levels and postsecondary intentions. College orientation activities can be held on reservations and urban Indian centers to better reach out to AI/AN families. Informative and culturally appealing materials can be made available to help parents plan for the day when their children may go to college. The students postsecondary intentions can be further developed and maintained by counselors in high school who can assist students prior to and during their pursuit of a postsecondary degree (Bransford, 1982; Kleinfeld, Cooper, & Kyle, 1987).

The findings also support Eberhard (1989), Wilson (1983), and Wittaker (1986) studies, and suggest that high schools should allow AI/AN students to acquire the academic skills and personal abilities that will allow them to cope with the rigors of pursuing a postsecondary degree. As implied by the sophomore cohort results and pointed out by Newell and Tyon (1989), programs directed at developing skills and abilities should reach AI/AN students early in their high school experience rather than later. This means encouraging AI/AN students to

participate in college preparatory classes or develop study skills that will be needed in college rather than tracking them into predominantly vocational or general programs of study.

The statistically significant effects of academic integration on postsecondary intentions dictate that academic support services should be in place to positively influence AI/AN degree attainment. Consistent with Falk and Aitken's (1984) study, institutional outreach that develops family and community support and provides sufficient college orientation should be complemented with retention programs that provide aggressive academic support. Efforts to promote academic integration of AI/AN students could include informal faculty/student activities that lead to positive interaction inside and outside the classroom (Lin, LaCounte, & Eder, 1988; Erickson, 1986; Erickson & Shultz, 1982; Scollen, 1981). In addition, required first year orientation activities could instruct students on how to locate and use various academic resources as well as cultivating student support networks on campus in order to improve classroom performance (McNamara, 1981; Wells, 1989). As called for by Guyette and Heth (1984), Fallows (1987), and Kleinfeld (1987), it may be necessary to hire a critical mass of faculty role models who could assist AI/AN students to adjust to the demands of college. In addition, it is important that academic advisors and faculty understand the stress related factors that AI/AN students encounter (Padilla & Pavel, 1989; Skye, Christensen, & England, 1989).

Problems associated with college academic life and postsecondary outcome are complicated by a lack of positive social integration experiences. Support programs are needed that ameliorate home sickness and that buffer the transition

from the social environment of the high school to the collegiate social environment. As others have indicated, promoting ethnic studies and pride (Wright, 1985; Scott, 1986; Kirk, 1989), ethnic student enclaves (Murgiá, Padilla, & Pavel, 1991), and culturally appropriate activities (Bennett, 1990; Jeanotte, 1980; Huffman, Sill, & Brokenleg, 1986; Swisher & Deyhle, 1987) are worthwhile efforts that help students adjust to the life on campus and cultivate the locus-of-control and positive self-concept so important in maintaining the motivational level to finish college. Collectively, such efforts could play an important role in enhancing the institutional experience of AI/AN students seeking to complete a degree program.

Implications for Future Research

While discussed at length elsewhere (Pavel & Reiser, 1991), at least two issues should be addressed to improve future research using HS&B or other NCES data bases to examine AI/AN postsecondary departure. The first issue involves increasing the AI/AN sample. A related issue is the inclusion of better indicators in the data base to fully operationalize relevant constructs in Tinto's model.

The sample size of AI/ANs must be increased if we are to extend our thinking on the complex web of factors that influence AI/ANs to either flounder or succeed in America's education system. Such issues can be investigated properly only with samples of appropriate size and inclusivity. To address this sampling issue, NCES should make a special effort to compile data bases with a sufficient sample of AI/ANs so that more insightful research can be conducted across various tribal groups and institution types. It is suggested that NCES sample schools in states that have high concentrations of AI/ANs since ten states have 66 percent of the AI/AN populations (Hodgkinson, Outtz, & Obarakpor, 1990).

Another issue is the selection of HS&B survey items to serve as indicators of constructs in Tinto's model. In the present study, it is uncertain whether some of the indicators are adequate since there was no way to assess them using sophisticated measurement models. As already stated, this deficiency was largely due to the small sample size. Similarly, the negative coefficients found in this study linking prior schooling and institutional commitment to outcome appear unusual. These unexpected coefficients could be due to faulty indicators, such as the outcome measure which considers *any* postsecondary degree against *no* postsecondary degree. Such an indicator may not be specific enough to take into account the variation in outcome that may be attributable to the type of degree being pursued.

Conclusion

The purpose of this study was to assess Tinto's model of institutional departure using American Indian and Alaskan Native (AI/AN) longitudinal data drawn from sophomore and senior cohorts in the High School and Beyond (HS&B) study. With minor revisions to the model, the findings suggest that family background, postsecondary intentions (both prior to and during college) and formal and informal academic integration are central to postsecondary outcomes for both cohorts. In addition, important aspects of the Tinto model for the sophomore cohort included the effects of academic skills, personal abilities, and prior schooling on initial postsecondary intentions. For the senior cohort, initial postsecondary intentions and goal commitment are important factors that influence academic integration. Based on these findings, it was suggested that there is a need to develop programs that foster positive postsecondary intentions early in an AI/AN

student's high school experience. Further, it was stressed that support programs should be in place to enhance academic and social integration while they are in college. Finally, it was recommended that the sample size of AI/ANs in National Center for Statistics' data bases like HS&B needs to be increased, and to improve the quality of indicators in such data bases so that better research can be conducted on American Indian and Alaskan Native postsecondary outcomes.

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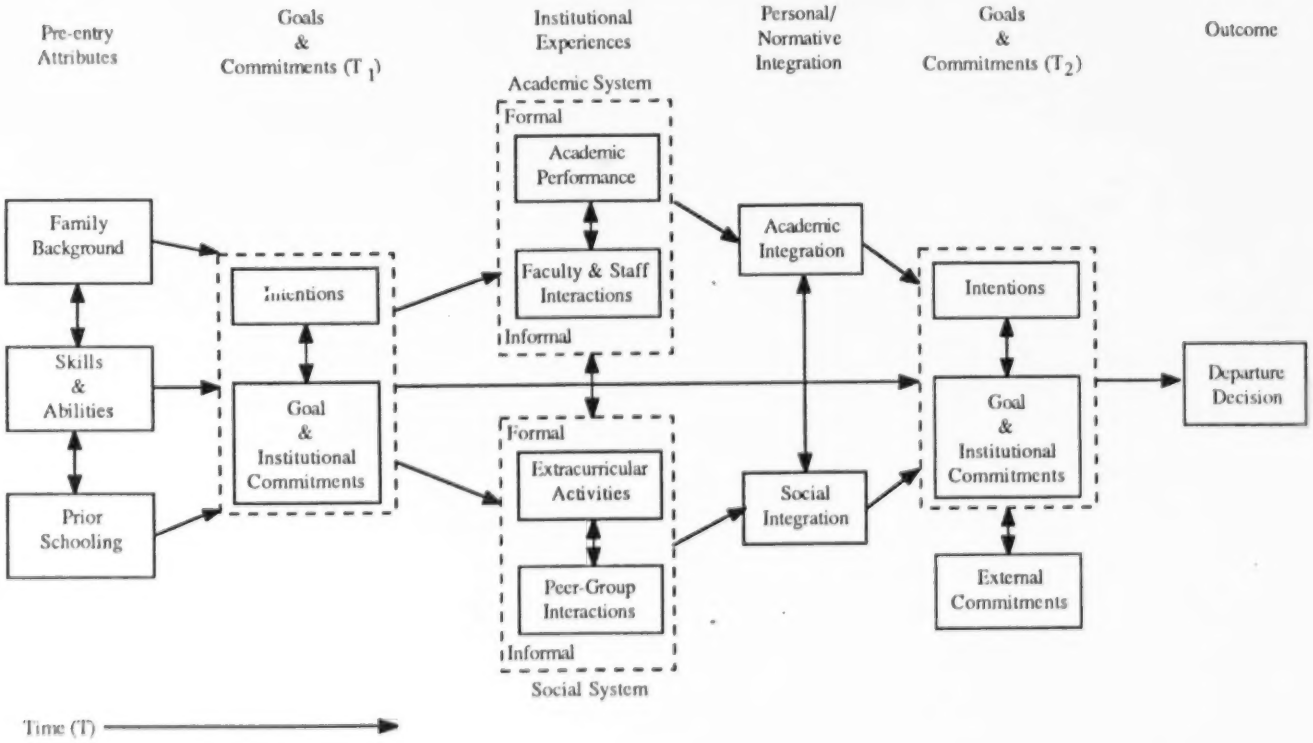
Table 1

Construct	Indicator and measurement
Family Background	Socioeconomic status (1=lowest, 4=highest), preference of parents on respondent's high school plans (1=no college, 4=college degree), regional location of high school (nominal scale: 1=rural, 3=urban).
Skills and Abilities	Math and language abilities (composite test scores), self-concept (composite scores), and locus of control (composite scores).
Prior Schooling	Self reported high school GPA (1=F, 8=A), high school program (1=vocational, 3=academic).
Intentions (T1)	Postsecondary aspirations (1=no college, 3=graduated degree), occupational aspirations (1=requires no college degree, 3=requires advanced degree).
Goal Commitment (T1)	Self reported ability to finish college (1=definitly not, 5=definitly yes)
Institutional Commitment (T1)	Lowest level of education satisfied with (1=no high school degree, 5=professional degree)
Formal Academic Integration	Satisfaction with: intellection growth, quality of teachers, and quality of instruction (1=not very satisfied, 5=very satisfied), self reported college GPA.
Informal Academic Integration	Satisfaction with: buildings, library, etc, and intellectual life on campus (1=not very satisfied, 5=very satisfied)
Formal Social Integration	Satisfaction with: sports and recreational facilities and cultural activities (1=not very satisfied, 5=very satisfied)
Informal Social Integration	Satisfaction with intellectual life on campus (1=not very satisfied, 5=very satisfied)
Intentions (T2)	Postsecondary aspirations (1=no college, 3=graduated degree), occupational aspirations (1=requires no college degree, 3=requires advanced degree).
Goal Commitment (T2)	Self reported ability to finish college (1=definitly not, 5=definitly yes)
Institutional Commitment (T2)	Satisfied with prestige of school (1=not very satisfied, 5=very satisfied)
Postsecondary Outcome	Educational attainment (1=No postsecondary degree, 2=postsecondary degree)

Figure 1. Tinto's model of institutional departure



Source: Tinto (1987), pg. 114

Figure 2. Significant paths in fitted Tinto model using LISCOMP results with HS&B AI/AN sophomore cohort

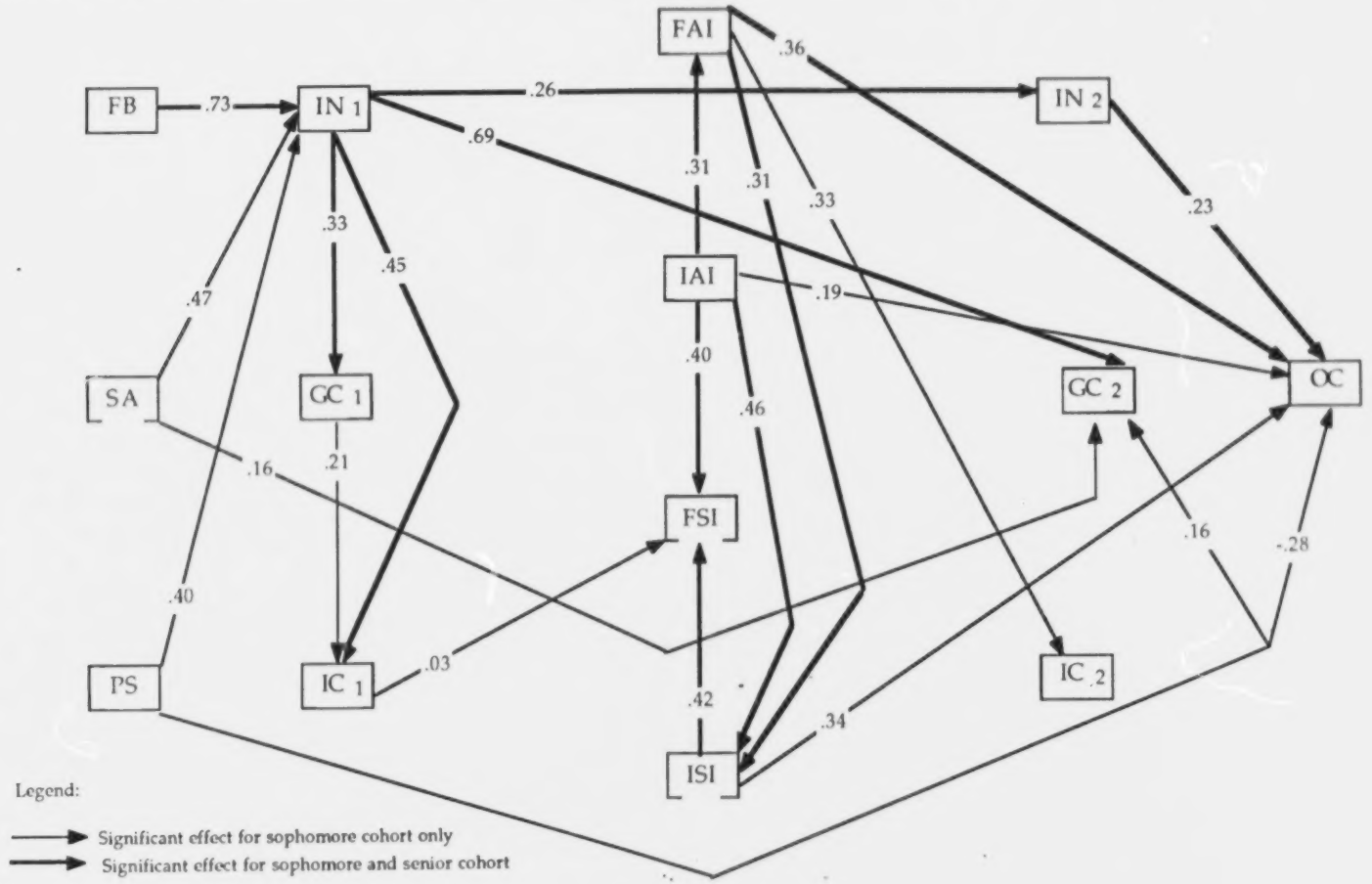


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Figure 3. Significant paths in fitted Tinto model using LISCOMP results with HS&B AI/AN senior cohort